WHAT IS CLAIMED IS:

1. A fuel cell comprising:

a first electrode having a catalyst for generating hydrogen;

a second electrode having a catalyst for generating oxygen, said second electrode being provided while allowed to be in contact with water; and

a proton conductive electrolyte membrane having a proton conductor produced by introducing proton dissociative groups into a base body composed of a carbonaceous material containing carbon as a main component, said electrolyte membrane being provided between said first electrode and second electrode;

wherein when a negative voltage is applied to said first electrode and a positive voltage is applied to said second electrode, oxygen, protons and electrons are generated from water under the presence of said catalyst at said second electrode, and hydrogen is generated from the protons and the electrons under the presence of said catalyst at said first electrode.

2. A fuel cell according to claim 1, further comprising a storing material for capturing and storing the hydrogen generated at said first electrode.

3. A fuel cell according to claim 2, wherein said

first electrode functions, in a state that no voltage is applied to said first electrode, as a fuel electrode which comes in contact with the hydrogen stored in said storing material, to generate protons and electrons from the hydrogen under the presence of said catalyst at said first electrode;

said electrolyte membrane functions, in a state that no voltage is not applied to each of said first electrode and second electrode, as an ion exchange membrane which conducts the protons generated at said first electrode to said second electrode; and

said second electrode functions, in a state that no voltage is applied to said second electrode, as an oxygen electrode which comes in contact oxygen, to generate water from the oxygen, the electrons, and the protons under the presence of said catalyst at said second electrode;

whereby said fuel cell releases electric power as a whole, to thus perform power generation.

4. A fuel cell according to claim 2, wherein said storing material is made from fullerene molecules, carbon nanotubes, or carbon nanofibers.

5. A fuel cell according to claim 2, wherein said storing material is made from a hydrogen storing alloy.

6. A fuel cell according to claim 5, wherein a separation membrane for preventing said storing material from being corroded is provided between said storing material and said first electrode.

7. A fuel cell according to claim 6, wherein said separation membrane is a hydrogen selectively permeable membrane.

8. A fuel cell according to claim 6, wherein said separation membrane is made from polyethylene, polypropylene, or polytetrafluoroethylene.

9. A fuel cell according to claim 2, wherein said storing material is in the form of fine particles which are aggregated into a storing body, and said storing body is disposed in proximity to said first electrode or directly connected to said first electrode.

10. A fuel cell according to claim 9, wherein a separation membrane for preventing said fine particles of said storing material from being scattered to said first electrode is provided between said storing material and said first electrode.

11. A fuel cell according to claim 10, wherein said separation membrane is a hydrogen selectively permeable membrane.

12. A fuel cell according to claim 10, wherein

said separation membrane is made from polyethylene, polypropylene, or polytetrafluoroethylene.

13. A fuel cell system having a plurality of membrane-electrode assemblies, each of said membrane-electrode assemblies comprising:

a first electrode having a catalyst for generating hydrogen;

a second electrode having a catalyst for generating oxygen, said second electrode being provided while allowed to be in contact with water; and

a proton conductive electrolyte membrane having a proton conductor produced by introducing proton dissociative groups into a base body composed of a carbonaceous material containing carbon as a main component, said electrolyte membrane being provided between said first electrode and second electrode;

wherein when a negative voltage is applied to said first electrode and a positive voltage is applied to said second electrode, oxygen, protons and electrons are generated from water under the presence of said catalyst at said second electrode, and hydrogen is generated from the protons and the electrons under the presence of said catalyst at said first electrode; and

wherein said first electrode functions, in a state

that no voltage is applied to said first electrode, as a fuel electrode which comes in contact with the hydrogen, to generate protons and electrons from the hydrogen under the presence of said catalyst at said first electrode;

said electrolyte membrane functions, in a state that no voltage is not applied to each of said first electrode and second electrode, as an ion exchange membrane which conducts the protons generated at said first electrode to said second electrode; and

said second electrode functions, in a state that no voltage is applied to said second electrode, as an oxygen electrode which comes in contact oxygen, to generate water from the oxygen, the electrons, and the protons under the presence of said catalyst at said second electrode;

whereby said membrane-electrode assembly constitutes a fuel cell as a whole, to releases electric power, thus performing power generation.

14. A fuel cell system according to claim 13, wherein each of said membrane-electrode assemblies has a storing material for capturing and storing the generated hydrogen and supplying the hydrogen to said fuel electrode.

15. A fuel cell system according to claim 13,

wherein at least one of said membrane-electrode assemblies acts as a gas supply source for generating hydrogen, and at least one of the rest of said membrane-electrode assemblies acts as a power generator communicated to said gas supply source.